

# Building Molecules to Kill Cancer:

## New Strides in Radiation Therapy

### California Science Content Standards

*The Science Standards for Grades Six through 12 that pertain to the subject matter for this Science on Saturday presentation have been summarized here for use by teachers. The numbering and lettering that are used in the [California State Science Standards](#) have been preserved in order that teachers can refer to them in context.*

#### **Grade Seven**

*Focus on Life Science*

##### **Cell Biology**

1. All living organisms are composed of cells, from just one to many trillions, whose details usually are visible only through a microscope. As a basis for understanding this concept:

- a. Students know cells function similarly in all living organisms.
- f. Students know that as multicellular organisms develop, their cells differentiate.

##### **Genetics**

2. A typical cell of any organism contains genetic instructions that specify its traits. Those traits may be modified by environmental influences. As a basis for understanding this concept:

- e. Students know DNA (deoxyribonucleic acid) is the genetic material of living organisms and is located in the chromosomes of each cell.

##### **Structure and Function in Living Systems**

5. The anatomy and physiology of plants and animals illustrate the complementary nature of structure and function. As a basis for understanding this concept:

- a. Students know plants and animals have levels of organization for structure and function, including cells, tissues, organs, organ systems, and the whole organism.
- b. Students know organ systems function because of the contributions of individual organs, tissues, and cells. The failure of any part can affect the entire system.

##### **Investigation and Experimentation**

7. Scientific progress is made by asking meaningful questions and conducting careful investigations. As a basis for understanding this concept and addressing the content in the other three strands, students should develop their own questions and perform investigations

a. Select and use appropriate tools and technology (including calculators, computers, balances, spring scales, microscopes, and binoculars) to perform tests, collect data, and display data.

## ***Grades Nine Through Twelve Biology/Life Sciences***

Science Content Standards

### **Genetics**

4. Genes are a set of instructions encoded in the DNA sequence of each organism that specify the sequence of amino acids in proteins characteristic of that organism. As a basis for understanding this concept:

c. Students know how mutations in the DNA sequence of a gene may or may not affect the expression of the gene or the sequence of amino acids in an encoded protein.

d. Students know specialization of cells in multicellular organisms is usually due to different patterns of gene expression rather than to differences of the genes themselves.

f.\* Students know why proteins having different amino acid sequences typically have different shapes and chemical properties.

5. The genetic composition of cells can be altered by incorporation of exogenous DNA into the cells. As a basis for understanding this concept:

c. Students know how genetic engineering (biotechnology) is used to produce novel biomedical and agricultural products.

## ***Grades Nine Through Twelve Chemistry***

Science Content Standards

### **Nuclear Processes**

11. Nuclear processes are those in which an atomic nucleus changes, including radioactive decay of naturally occurring and human-made isotopes, nuclear fission, and nuclear fusion. As a basis for understanding this concept:

c. Students know some naturally occurring isotopes of elements are radioactive, as are isotopes formed in nuclear reactions.

d. Students know the three most common forms of radioactive decay (alpha, beta, and gamma) and know how the nucleus changes in each type of decay.

e. Students know alpha, beta, and gamma radiation produce different amounts and kinds of damage in matter and have different penetrations.

***Grades Nine Through Twelve***  
***Investigation and Experimentation***

Science Content Standards

1. Scientific progress is made by asking meaningful questions and conducting careful investigations. As a basis for understanding this concept and addressing the content in the other four strands, students should develop their own questions and perform investigations. Students will [understand how scientists]:

a. Select and use appropriate tools and technology (such as computer-linked probes, spreadsheets, and graphing calculators) to perform tests, collect data, analyze relationships, and display data.

d. Formulate explanations by using logic and evidence.

g. Recognize the usefulness and limitations of models and theories as scientific representations of reality.

k. Recognize the cumulative nature of scientific evidence.

l. Analyze situations and solve problems that require combining and applying concepts from more than one area of science.

m. Investigate a science-based societal issue by researching the literature, analyzing data, and communicating the findings.